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**HAZARDOUS MATERIALS AT FERNALD
FERNALD ENVIRONMENTAL MANAGEMENT
PROJECT OCTOBER 1993**

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FACTSHEET

HAZARDOUS MATERIALS AT FERNALD

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FERNALD

Environmental Management Project

What Types of Radioactive Materials Are Stored at Fernald?

Uranium

Because of past operations at Fernald, radioactive materials such as uranium are stored on site. Uranium is a radioactive element that is common in nature. The uranium at Fernald is both a slightly radioactive and chemically toxic material. Most of the uranium at Fernald is not readily absorbed into the bloodstream and passes quickly out of the body if it is ingested. (This is known as insolubility.)

Insoluble uranium is more of a hazard if it is inhaled, because insoluble uranium deposits in the lungs do not pass out of the body quickly and may damage lung tissue. Uranium is stored in 14 buildings at the site. It is stored as a solid in 13 buildings and as a liquid in the laboratory in small quantities.

To detect the presence of radioactive materials anywhere in the body, including the lungs, Fernald employees are examined in one of the world's most advanced "In Vivo" (whole body) monitoring facilities. Continuous environmental monitoring, regulatory

inspections, and inventory control are precautionary measures taken to ensure maximum protection of the workers, the environment, and the surrounding community.

Thorium

Thorium is another naturally-occurring, radioactive element that is common in nature and stored at Fernald. More than 1,300 tons of thorium are stored in steel drums at Fernald. Most of the thorium at Fernald was processed on site; however, some of it came from other facilities owned by The Department of Energy.

The thorium stored at Fernald is a mixture of thorium metal, thorium oxides, and residues. Like any radioactive element, thorium gives off energy in the form of particles and rays of radiation and, in the process, changes into other elements. This process is called radioactive decay, and the resulting elements are called daughter products. Thoron is one of the daughter products of thorium and is continuously generated by the stored thorium.

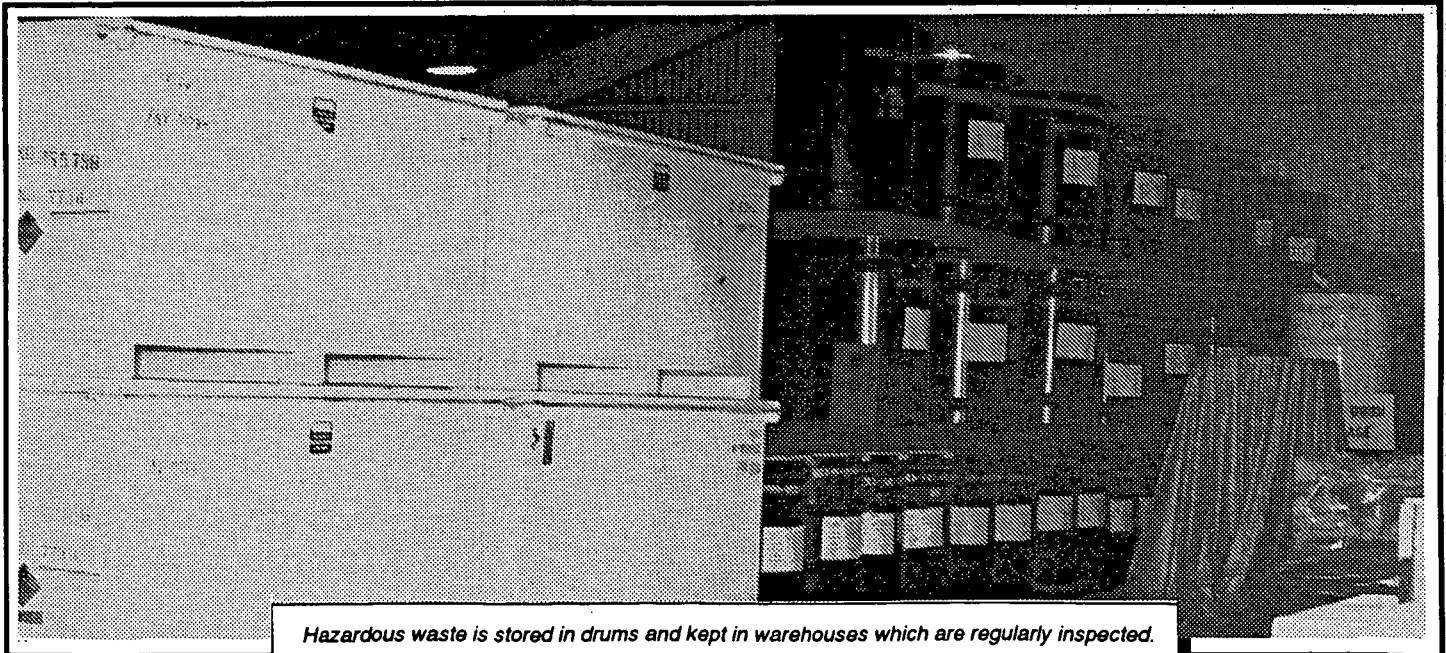
Once thorium is deposited into the body, it remains there. It tends to target the bones,

liver, lungs, and lymphatic glands. Only cuts or puncture wounds will allow thorium to penetrate skin. Exposure to the thorium at Fernald is kept to a minimum and safety precautions are essential.

Thorium is stored as a solid in five buildings at the site and stored as a liquid in small quantities in the lab building at Fernald. The thorium stored on site receives careful attention and management to ensure safety and isolation from personnel and the environment. Thorium oxides are now packaged in metal boxes and will remain stored in a warehouse until a decision is made on disposition of the material.

Radon

Radon is a naturally-occurring gas present in rocks, soil, water, and many common building materials. Radon is a gaseous radioactive decay product of uranium. In addition to uranium, thorium, and radon, Fernald has two K-65 silos that contain residues from processing uranium pitchblende ore. The two silos contain radium-bearing radioactive wastes dating back to the late 1940's. The K-65 silos are 36 feet tall and 80 feet in diameter. Their walls are 8 inches thick and made of steel-reinforced concrete.



Hazardous waste is stored in drums and kept in warehouses which are regularly inspected.

The radioactive levels of the stored residues in the K-65 silos are high and these residues produce radon gas. Several steps have been taken to control radon emissions from the K-65 silos. For example, a radon treatment system was constructed in the late 1980s, and radon gas monitors were installed around the Fernald boundary and in the immediate vicinity of the K-65 silos.

Bentonite clay was installed over the radium-bearing radioactive waste material in the K-65 silos. Covering the silos with a layer of bentonite clay accomplished two major objectives. First, it substantially reduced the accumulation of radon in the silo headspace, between the surface residues and the dome, thereby reducing radon emissions to the environment. Second, it provided protection from a potential release to the environment in the event of a silo dome collapse.

The amount of radon to which we are exposed varies. High levels of radon can result from loose, unpacked soil, poor building ventilation, and the use of building materials that have a high radium content. Radon usually enters buildings or homes through floors and foundations; however, cracks, joints, and openings, for pipes in concrete floors tend to decrease this inhibiting effect.

Once again, precautions are taken to ensure the safety of employees and residents. A comprehensive radon monitoring program is in place at Fernald to assess the effectiveness of Fernald's environmental controls.

What Types of Chemicals Are Stored at Fernald?

Although radiation is a significant hazard, the hazard of most concern at Fernald is presented by industrial chemicals. While some hazardous chemicals are still stored on site, most of the inventories of chemicals such as Anhydrous Hydrogen Fluoride (AHF) and anhydrous ammonia, used in the past production process, have been removed. Chemicals remaining at Fernald include:

- ☐ Chlorine
- ☐ Sulfuric Acid
- ☐ Hydrofluoric Acid
- ☐ Nitric Acid

Chlorine

Chlorine is stored as a gas in three buildings at Fernald. Chlorine is often used for water treatment at Fernald, and when properly used, poses no health hazard. A potential hazard exists when accidental spills or leaks happen during transportation and storage.

Chlorine is a strong irritant to the eyes, nose, throat, airways, and lungs. If one is exposed to large amounts of chlorine, symptoms include coughing, choking, headache, and dizziness. In the case of an accident involving chlorine at Fernald, emergency precautions would be taken immediately.

Sulfuric Acid

Sulfuric acid is stored in 11 buildings at Fernald. The largest single container capacity stored at Fernald is 1500 gallons stored in the biodentrification tower. Sulfuric Acid, like chlorine, is used for water treatment at Fernald. Sulfuric acid is the main component of acid rain, which causes widespread environmental damage. It is often detected near electric power plants that burn coal and near factories that process metal ores. Exposure to sulfuric acid causes constriction of the air pathways and damage to the lungs if inhaled.

In addition, sulfuric acid affects trees, lakes and rivers, and soils. 1990 amendments to the Clean Air Act require that emissions of sulfur dioxide be reduced by 10 million tons per year by the year 2000. This will reduce amounts of sulfuric acid. This reduction is to come from utilities and other sources.

Hydrofluoric Acid

Hydrofluoric acid is stored in six buildings at Fernald. Hydrofluoric acid is commonly found in industry, and is often found in rust removers. Hydrofluoric acid can cause severe burns on contact, respiratory damage if inhaled, and eye irritation.

Nitric Acid

Nitric acid is stored in nine buildings at Fernald, and the largest container quantity is 753 gallons located south of the Ore Refinery Plant. Nitrogen oxides are a group of air pollutants formed during the combustion of

fuels and in subsequent chemical reactions in the atmosphere. Dissolved in the water of fog, rain, and snow, nitrogen dioxide turns to nitric acid, causing ecological damage in the form of acid rain.

Nitric acid is a deep lung irritant that damages the delicate cells lining the lungs. The Environmental Protection Agency sets air quality standards to protect human health and to prevent damage to the environment. The standards are subject to periodic review and revision as necessary. The Clean Air Act requires emissions of nitrogen oxides in the year 2000 be reduced by 2.5 million tons per year below the levels projected for that year.

Fernald Emergency Response

Safe management of the hazardous materials is a major priority for employees and management at Fernald. A constant state of readiness is maintained for chemical or radiological releases that could harm people or the environment.

The Fernald Emergency Warning System is a network of sirens used to quickly warn people within the two mile Immediate Notification Zone of any site accident or situation that might have off-site impact. Emergencies at Fernald could include chemical releases, fires, or any similar situation that may affect people living near the plant.

In addition to the Fernald Emergency Warning System, the site also has an Emergency Operations Center that operates in the event of an emergency or a potentially serious event at the site. The Emergency Preparedness Staff consists of six employees who keep track of daily activities at the site including all accidents. The Emergency Preparedness Staff correlates efforts with the Fernald Emergency Response Team. This team is prepared for an emergency at all times if needed. This includes taking protective measures both on and off site for safety.

For more information about this topic or about other Fernald activities and issues, contact the Office of Public Information, DOE Fernald Field Office, at (513) 648-3131.